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Kato

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(54) **IMAGING APPARATUS, IMAGING CONTROL METHOD AND STORAGE MEDIUM**

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This patent is subject to a terminal disclaimer.

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(Continued)

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(Continued)

(58) **Field of Classification Search**
None
See application file for complete search history.

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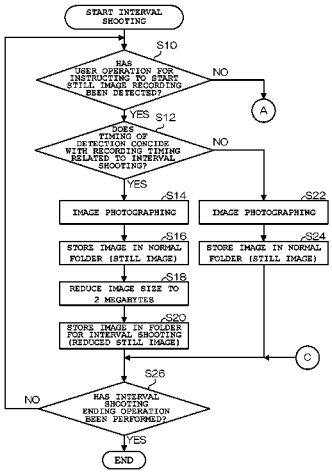
(74) *Attorney, Agent, or Firm* — Holtz, Holtz & Volek PC

(57) **ABSTRACT**

An imaging apparatus including an imaging sensor, a memory, and a CPU. The CPU is operable as: (i) repeatedly acquiring an image by driving the imaging sensor at preset timing, (ii) acquiring an image by driving the imaging sensor by receiving an instruction at arbitrary timing, while maintaining acquisition processing by the (i), (iii) storing, in the memory, the image acquired by the (i) and the image acquired by the (ii), (iv) judging whether the arbitrary timing and the preset timing coincide with each other, and (v) when judged that the arbitrary timing and the preset timing coincide with each other as a result of a judgment of the (iv), controlling to store, in the memory, the image acquired by one of the (i) and the (ii), as the image acquired by the other of the (i) and the (ii), or controlling the imaging sensor.

12 Claims, 7 Drawing Sheets



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H04N 5/77 (2006.01)
H04N 5/907 (2006.01)
H04N 9/804 (2006.01)

(52) **U.S. Cl.**
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FIG. 1

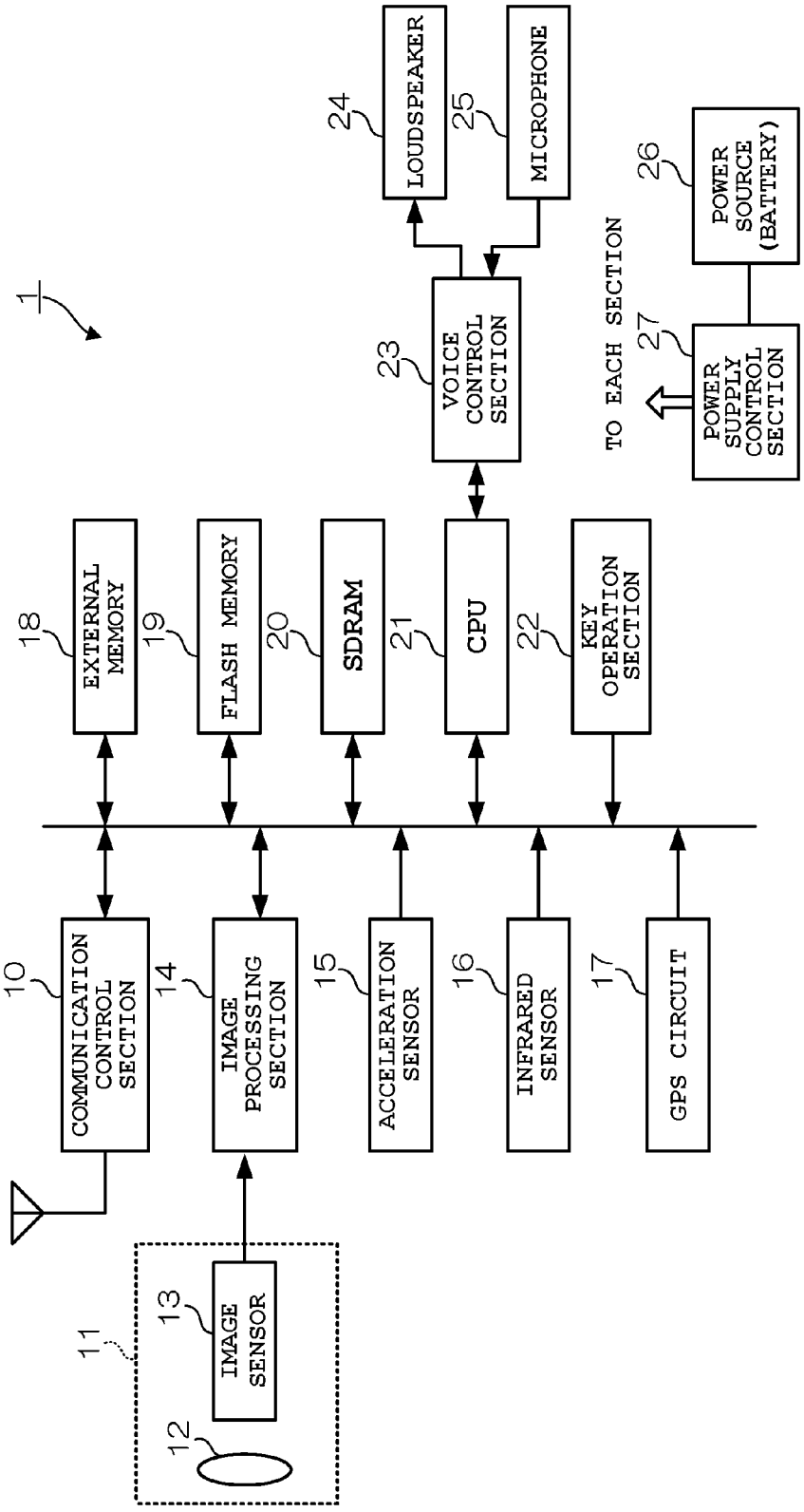

1
10
COMMUNICATION CONTROL SECTION
11
12
13
IMAGE SENSOR
14
IMAGE PROCESSING SECTION
15
ACCELERATION SENSOR
16
INFRARED SENSOR
17
GPS CIRCUIT
18
EXTERNAL MEMORY
19
FLASH MEMORY
20
SDRAM
21
CPU
22
KEY OPERATION SECTION
23
VOICE CONTROL SECTION
24
LOUDSPEAKER
25
MICROPHONE
26
POWER SOURCE (BATTERY)
27
POWER SUPPLY CONTROL SECTION
TO EACH SECTION

FIG. 2

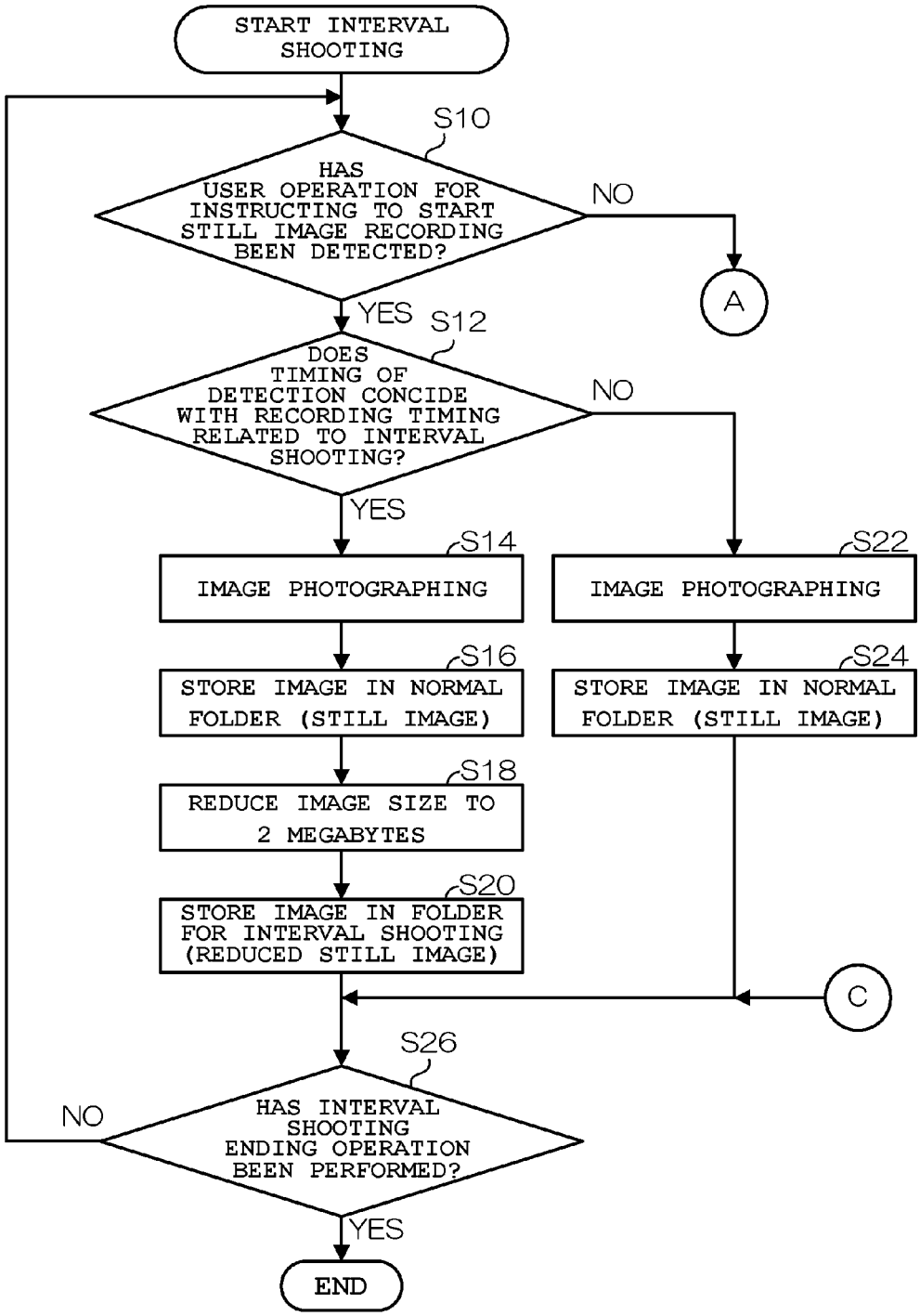

START INTERVAL SHOOTING
S10
HAS USER OPERATION FOR INSTRUCTING TO START STILL IMAGE RECORDING BEEN DETECTED?
NO
A
YES
S12
DOES TIMING OF DETECTION CONCIDE WITH RECORDING TIMING RELATED TO INTERVAL SHOOTING?
NO
YES
S14
IMAGE PHOTOGRAPHING
S16
STORE IMAGE IN NORMAL FOLDER (STILL IMAGE)
S18
REDUCE IMAGE SIZE TO 2 MEGABYTES
S20
STORE IMAGE IN FOLDER FOR INTERVAL SHOOTING (REDUCED STILL IMAGE)
S22
IMAGE PHOTOGRAPHING
S24
STORE IMAGE IN NORMAL FOLDER (STILL IMAGE)
C
S26
HAS INTERVAL SHOOTING ENDING OPERATION BEEN PERFORMED?
NO
YES
END

FIG. 3

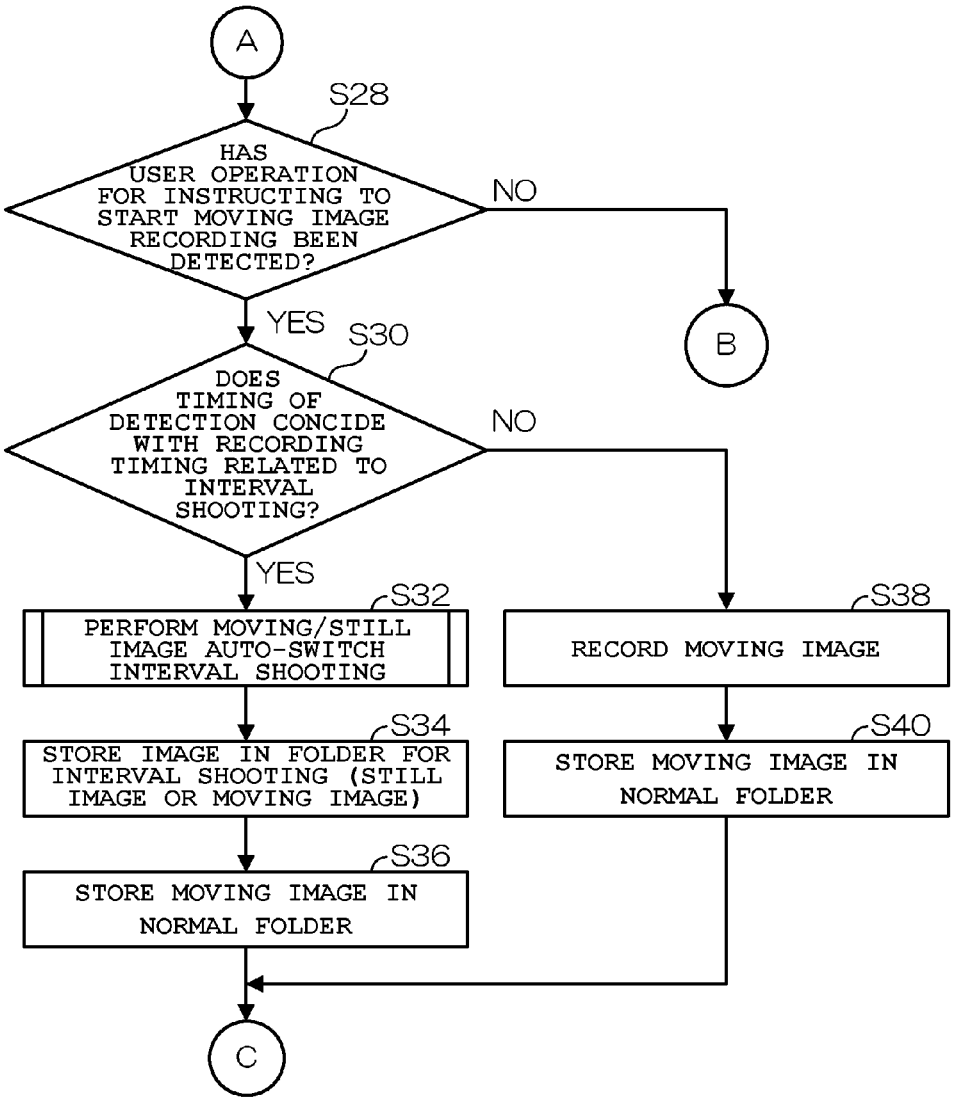

A
S28
HAS USER OPERATION FOR INSTRUCTING TO START MOVING IMAGE RECORDING BEEN DETECTED?
NO
B
YES
S30
DOES TIMING OF DETECTION CONCIDE WITH RECORDING TIMING RELATED TO INTERVAL SHOOTING?
NO
YES
S32
PERFORM MOVING/STILL IMAGE AUTO-SWITCH INTERVAL SHOOTING
S34
STORE IMAGE IN FOLDER FOR INTERVAL SHOOTING (STILL IMAGE OR MOVING IMAGE)
S36
STORE MOVING IMAGE IN NORMAL FOLDER
S38
RECORD MOVING IMAGE
S40
STORE MOVING IMAGE IN NORMAL FOLDER
C

FIG. 4

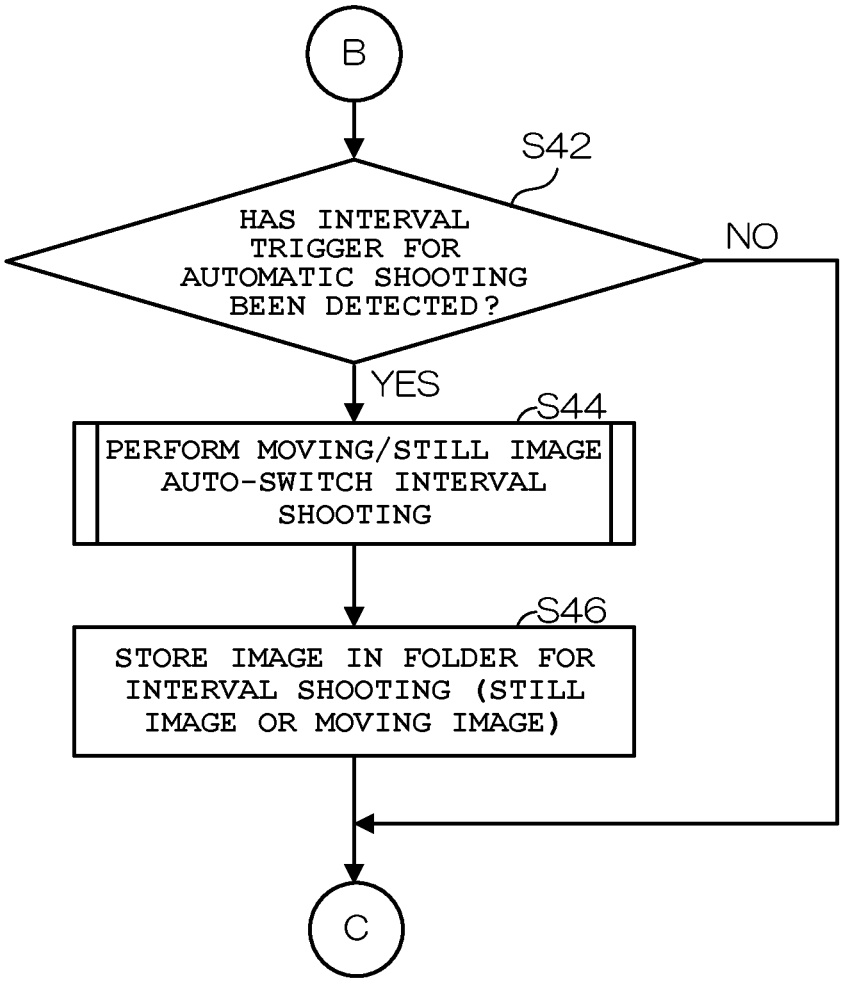

B
S42
HAS INTERVAL TRIGGER FOR AUTOMATIC SHOOTING BEEN DETECTED?
NO
YES
S44
PERFORM MOVING/STILL IMAGE AUTO-SWITCH INTERVAL SHOOTING
S46
STORE IMAGE IN FOLDER FOR INTERVAL SHOOTING (STILL IMAGE OR MOVING IMAGE)
C

FIG. 5

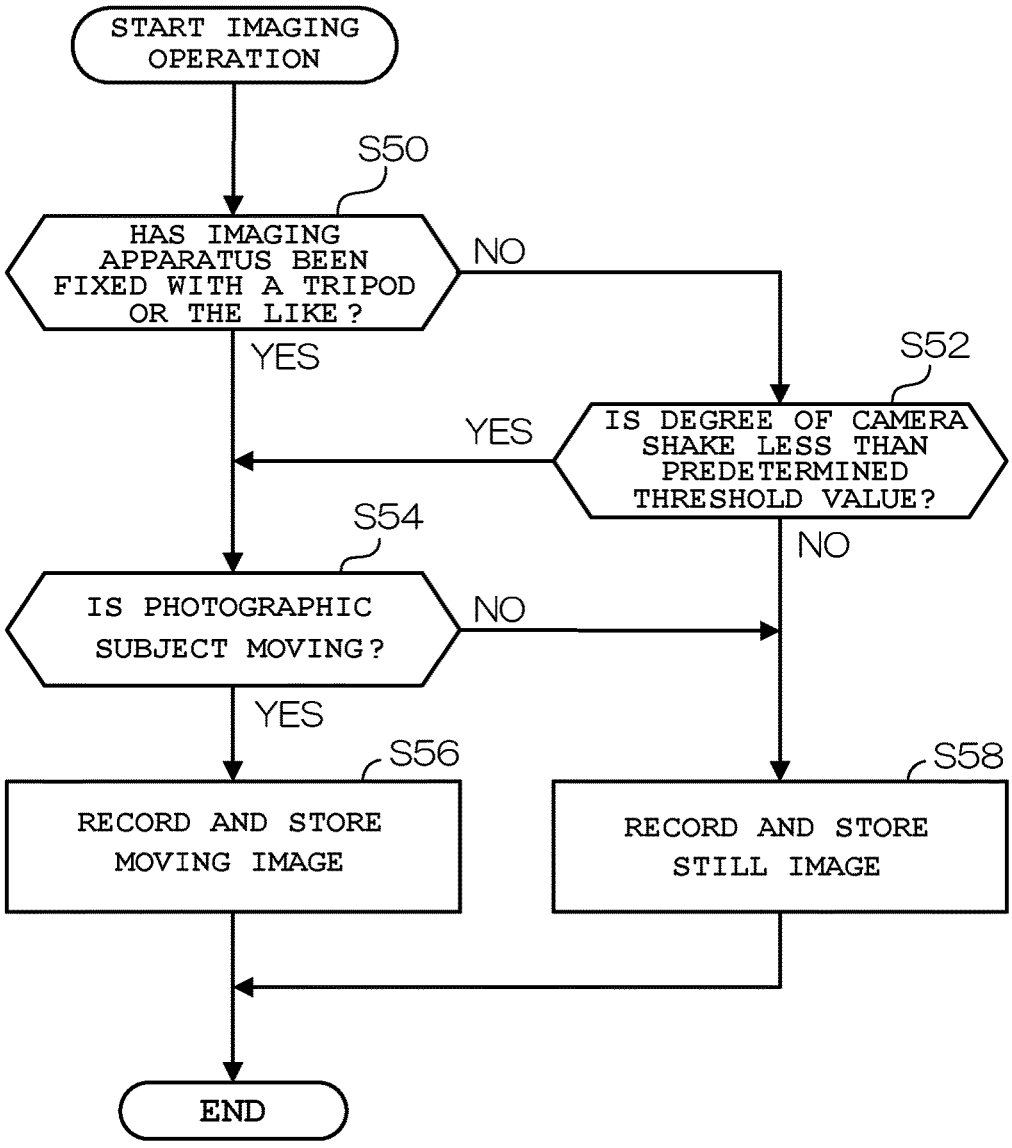

START IMAGING OPERATION
S50
HAS IMAGING APPARATUS BEEN FIXED WITH A TRIPOD OR THE LIKE?
NO
YES
S52
IS DEGREE OF CAMERA SHAKE LESS THAN PREDETERMINED THRESHOLD VALUE?
YES
NO
S54
IS PHOTOGRAPHIC SUBJECT MOVING?
NO
YES
S56
RECORD AND STORE MOVING IMAGE
S58
RECORD AND STORE STILL IMAGE
END

FIG. 6

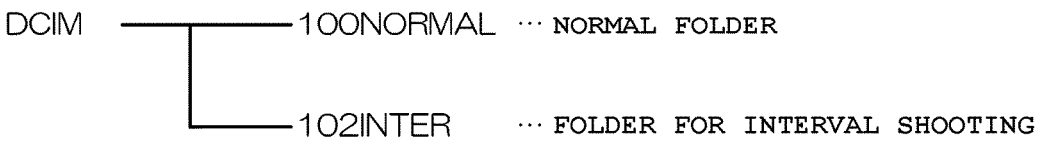
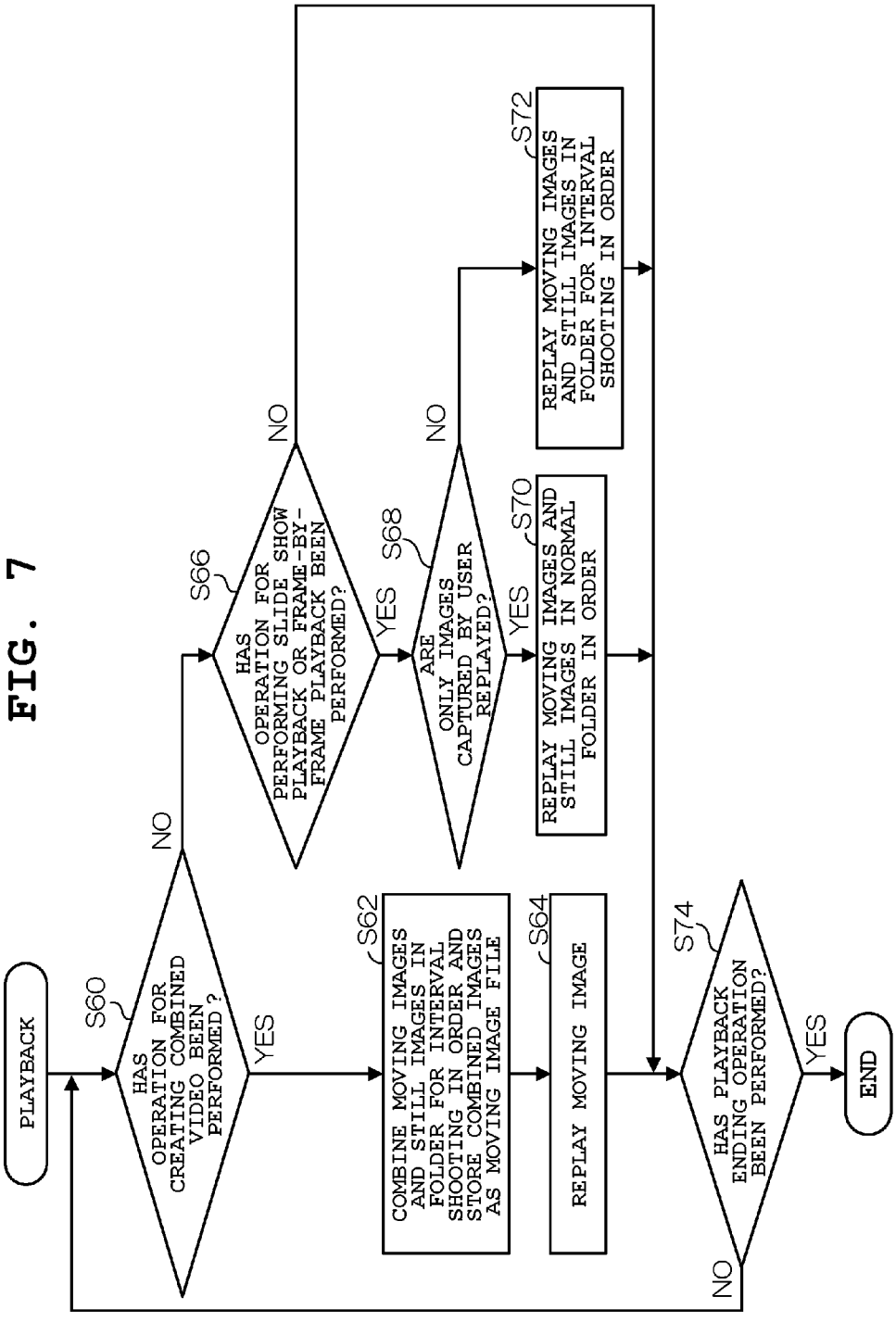

DCIM
100NORMAL
··· NORMAL FOLDER
102INTER
··· FOLDER FOR INTERVAL SHOOTING

FIG. 7


PLAYBACK
S60
HAS OPERATION FOR CREATING COMBINED VIDEO BEEN PERFORMED?
YES
NO
S62
COMBINE MOVING IMAGES AND STILL IMAGES IN FOLDER FOR INTERVAL SHOOTING IN ORDER AND STORE COMBINED IMAGES AS MOVING IMAGE FILE
S64
REPLAY MOVING IMAGE
S66
HAS OPERATION FOR PERFORMING SLIDE SHOW PLAYBACK OR FRAME-BY-FRAME PLAYBACK BEEN PERFORMED?
YES
NO
S68
ARE ONLY IMAGES CAPTURED BY USER REPLAYED?
YES
NO
S70
REPLAY MOVING IMAGES AND STILL IMAGES IN NORMAL FOLDER IN ORDER
S72
REPLAY MOVING IMAGES AND STILL IMAGES IN FOLDER FOR INTERVAL SHOOTING IN ORDER
S74
HAS PLAYBACK ENDING OPERATION BEEN PERFORMED?
YES
NO
END

IMAGING APPARATUS, IMAGING CONTROL METHOD AND STORAGE MEDIUM

CROSS-REFERENCE TO RELATED APPLICATION

This application is a Divisional application of U.S. Ser. No. 14/596,887, filed Jan. 14, 2015, which is based upon and claims the benefit of priority from the prior Japanese Patent Application No. 2014-010126, filed Jan. 23, 2014, the entire contents of both of which are incorporated herein by reference.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an imaging apparatus, an imaging control method and a storage medium.

2. Description of the Related Art

As described in Japanese Patent Application Laid-Open (Kokai) Publication No. 2005-286551, an imaging apparatus having an interval shooting function is conventionally known.

This interval shooting function, which is commonly used for the purpose of prolonged observation or monitoring, is generally configured to continue until "some conditions" are satisfied.

The "some conditions" herein include a condition that the image memory is full and further imaging operations cannot be performed and a condition that the interval shooting function has been canceled by an external operation.

SUMMARY OF THE INVENTION

In accordance with one aspect of the present invention, there is provided an imaging apparatus comprising: an imaging section; a first acquiring section which repeatedly acquires an image by driving the imaging section at preset timing; a second acquiring section which acquires an image by driving the imaging section by receiving an instruction at arbitrary timing, while maintaining acquisition processing by the first acquiring section; a storing section which stores the image acquired by the first acquiring section and the image acquired by the second acquiring section; a judging section which judges whether the arbitrary timing and the preset timing coincide with each other; and a controlling section which controls at least one of imaging by the imaging section and storing of the image in the storing section, based on a judgment result by the judging section.

In accordance with another aspect of the present invention, there is provided an image controlling method for an imaging apparatus including an imaging section, comprising: a first acquiring step of repeatedly acquiring an image by driving the imaging section at preset timing; a second acquiring step of acquiring an image by driving the imaging section by receiving an instruction at arbitrary timing, while maintaining acquisition processing in the first acquiring step; a storing step of storing the image acquired in the first acquiring step and the image acquired in the second acquiring step; a judging step of judging whether the arbitrary timing and the preset timing coincide with each other; and a controlling step of controlling at least one of imaging by the imaging section and storing of the image, based on a judgment result in the judging step.

In accordance with another aspect of the present invention, there is provided a non-transitory computer-readable storage medium having stored thereon a program that is executable by a computer in an imaging apparatus including an imaging section, the program being executable by the computer to perform functions comprising: first acquisition processing for repeatedly acquiring an image by driving the imaging section at preset timing; second acquisition processing for acquiring an image by driving the imaging section by receiving an instruction at arbitrary timing, while maintaining the first acquisition processing; storing processing for storing the image acquired in the first acquisition processing and the image acquired in the second acquisition processing; judgment processing for judging whether the arbitrary timing and the preset timing coincide with each other; and control processing for controlling at least one of imaging by the imaging section and the storing processing, based on a judgment result in the judgment processing.

The above and further objects and novel features of the present invention will more fully appear from the following detailed description when the same is read in conjunction with the accompanying drawings. It is to be expressly understood, however, that the drawings are for the purpose of illustration only and are not intended as a definition of the limits of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram showing the structure of an imaging apparatus **1** according to an embodiment of the present invention;

FIG. **2** is a flowchart for describing operations in interval shooting by the imaging apparatus **1** of the embodiment;

FIG. **3** is also a flowchart for describing operations in interval shooting by the imaging apparatus **1** of the embodiment;

FIG. **4** is also a flowchart for describing operations in interval shooting by the imaging apparatus **1** of the embodiment;

FIG. **5** is a flowchart for describing operations in moving/still image auto-switch interval shooting;

FIG. **6** is a conceptual diagram showing an example of the folder structure of an external memory **18** for the imaging apparatus **1** of the embodiment; and

FIG. **7** is a flowchart for describing a playback operation by the imaging apparatus **1** of the embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

An embodiment of the present invention will hereinafter be described with reference to the drawings.

A. Structure of Embodiment

FIG. **1** is a block diagram showing the structure of an imaging apparatus **1** according to an embodiment of the present invention. In FIG. **1**, a head-mounted imaging apparatus **1** includes a communication control section **10**, an imaging section **11**, an image processing section **14**, an acceleration sensor **15**, an infrared sensor **16**, a GPS (Global Positioning System) circuit **17**, an external memory **18**, a flash memory **19**, a SDRAM (Synchronous Dynamic Random Access Memory) **20**, a CPU (Central Processing Unit) **21**, a key operation section **22**, a voice control section **23**, a

loudspeaker **24**, a microphone **25**, a power source (battery) **26**, and a power supply control section **27**.

The communication control section **10** transfers captured image data (still images or moving images) to a server on the Internet, or to an information processing device such as a personal computer via the Internet, etc.

This communication control section **10** can also transfer a live view image or images being recorded to an external replay/display apparatus via peer-to-peer communications.

The imaging section **11** includes a lens block **12** constituted by an optical lens group and an image sensor **13** such as a CCD (Charge Coupled Device) or CMOS (Complementary Metal-Oxide Semiconductor).

The image sensor **13** converts an image entering from the lens block **12** to a digital signal.

The image processing section **14** performs image processing (such as pixel interpolation processing, γ correction, luminance color-difference signal generation, white balance processing, and exposure correction processing) and compression and expansion of image data (for example, compression and expansion of a JPEG (Joint Photographic Experts Group) format, Motion-JPEG format, or MPEG (Moving Picture Experts Group) format).

The acceleration sensor **15** detects the movement of the imaging apparatus **1** which is made in conjunction with the movement of a user's head.

The CPU **21** judges whether the imaging apparatus **1** has been fixed (with a tripod) or handheld and determines the degree of camera shake from a detection result of the acceleration sensor **15**.

The infrared sensor **16** detects the movement of a photographic subject.

The CPU **21** detects the movement of a photographic subject from images captured by the image sensor **13** or a detection result of the infrared sensor **16**.

The GPS circuit **17** acquires the positional information of the head-mounted imaging apparatus **1**.

In this embodiment, positional information acquired by the GPS circuit **17** is used to, for example, determine imaging timing for interval shooting.

The external memory **18** is a removable storage medium, and stores image data captured by the imaging section **11** and the like.

The flash memory **19** is a storage medium for storing image data captured by the imaging section **11** and the like.

The SDRAM **20** is used as a buffer memory for temporarily storing image data captured by the imaging section **11** and sent to the CPU **21**, and is also used as a working memory for the CPU **21**.

The CPU **21** is a one-chip microcomputer for controlling each section of the head-mounted imaging apparatus **1**.

In interval shooting, the CPU **21** switches between still image photographing and moving image capturing by interval triggers at predetermined timing, according to the occurrence conditions of motion blur and camera shake.

In particular, in the present embodiment, when a user operation (shutter button depression) for instructing to start still image recording or a user operation (REC button depression) for instructing to start moving image recording is performed and detected while interval shooting is being performed, the CPU **21** starts still image photographing or moving image capturing in accordance with the user operation, without temporarily stopping the interval shooting.

If the detection timing at which a user operation (shutter button depression) for instructing to start still image recording or a user operation (REC button depression) for instructing to start moving image recording is detected coincides with interval shooting timing, a still image or a moving image recorded in response to the user's instruction operation is stored in a normal imaging manner, and also stored to be usable as material for the interval shooting.

Specifically, in the normal imaging, images are stored in a normal folder in the external memory **18**. In the case where images are used as material for interval shooting, they are stored in a folder for interval shooting in the external memory **18**.

Also, when selectively switching between still image photographing and moving image capturing according to the occurrence conditions of motion blur and camera shake, the CPU **21** judges whether the imaging apparatus **1** has been fixed with a tripod or the like or been handheld by the user, or in other words, in a state which has not been fixed with a tripod or the like, from a detection result of the acceleration sensor **15**.

In addition, the CPU **21** judges the degree of camera shake from a detection result of the acceleration sensor **15**.

Moreover, the CPU **21** judges whether the photographic subject is moving or standing still from a comparison result between the frames of images captured by the image sensor **13** or a detection result of the infrared sensor **16**.

Then, the CPU **21** selects a moving image (such as a short video of five seconds) or a still image (high sensitivity/high-speed shutter) as contents to be imaged and recorded in the interval shooting, based on whether or not the imaging apparatus **1** has been fixed with a tripod or the like, the degree of the camera shake of the imaging apparatus **1**, and whether the photographic subject is moving or standing still, and then controls to perform processing therefor.

In still image photographing and recording, the CPU **21** photographs and records a less blurred image by changing imaging conditions (high sensitivity/high-speed shutter).

The key operating section **22** inputs an operation mode or an operation instruction for starting, pausing, or stopping image capturing in response to a touch operation from a user.

The audio control section **23** converts audio (such as alarm sound) at the time of the playback of captured moving images to an analog signal and outputs it from the loudspeaker **24**, under the control of the CPU **21**. Also, the audio control section **23** digitalizes and captures environmental sound collected by the microphone **25** in moving image capturing. The power supply (battery) **26** is a rechargeable secondary battery.

The power supply control section **27** stabilizes the output voltage of the power supply (battery) **26**, and supplies driving electric power to each section.

B. Operation of Embodiment

Next, the operation of the present embodiment is described.

FIG. **2** to FIG. **4** are flowcharts for describing operations in interval shooting by the imaging apparatus **1** of the present embodiment.

When an interval shooting mode is set in the imaging apparatus **1**, the timing of interval shooting comes by the trigger of interval shooting occurring at predetermined timing.

As this trigger, time intervals (for example, every five minutes) or distance intervals (for example, every one kilometer) acquired from GPS information may be used.

In addition, various triggers for automatic shooting may be used, such as a trigger that occurs when the imaging apparatus **1** is judged to be positioned in a specified area by

use of GPS information, or a trigger that occurs when a signal is received from a communication device in an external device.

In the interval shooting mode, the CPU **21** first judges whether a user operation (shutter button depression) for instructing to start still image recording has been detected (Step S**10**).

Subsequently, when judged that a user operation (shutter button depression) for instructing to start still image recording has been detected in the interval shooting mode (YES at Step S**10**), the CPU **21** judges whether this operation has been detected during recording related to interval shooting, or in other words, judges whether the timing of the detection of the user operation (shutter button depression) for instructing to start still image recording coincides with recording timing related to interval shooting (Step S**12**).

Then, when judged that the timing of the detection of the instruction operation (shutter button depression) coincides with recording timing related to interval shooting (YES at Step S**12**), the CPU **21** controls the imaging section **11** to perform normal still image photographing under currently set imaging conditions (Step S**14**).

Next, the CPU **21** stores a photographed still image in the normal folder in the external memory **18** (Step S**16**).

Then, the CPU **21** reduces the size of the photographed still image to a size set for interval shooting, such as a size of about 2 megabytes (Step S**18**), and stores the reduced still image in the folder for interval shooting in the external memory **18** (Step S**20**).

That is, in the interval shooting mode, when it is judged that a user operation (shutter button depression) for instructing to start still image recording coincides with recording timing related to interval shooting, imaging processing is set such that normal still image photographing is performed.

Then, after the photographing, a photographed still image is stored in the normal folder, and an image acquired by the photographed still image being reduced to a size of about 2 megabytes set for interval shooting is stored in the folder for interval shooting in the external memory **18** as material for interval shooting.

At Step S**12**, when judged that the timing of the detection of the instruction operation (shutter button depression) does not coincide with recording timing related to interval shooting (NO at Step S**12**), the CPU **21** controls the imaging section **11** to perform still image photographing under current imaging conditions set for normal still image recording (Step S**22**), and stores a photographed still image in the normal folder in the external memory **18** (Step S**24**).

That is, when a user operation (shutter button depression) for instructing to start still image recording is performed at timing other than recording timing related to interval shooting, a photographed still image is stored in the normal folder in the external memory **18** in a normal imaging manner.

After Steps S**20** and S**24**, the CPU **21** judges whether a user operation for ending the interval shooting has been performed (Step S**26**).

Then, when judged that an operation for ending the interval shooting has not been performed (NO at Step S**26**), the CPU **21** returns to Step S**10**.

At Step S**10**, when judged that a user operation (shutter button depression) for instructing to start still image recording has not been detected in the interval shooting mode (NO at Step S**10**), the CPU **21** judges whether a user operation (REC button depression) for instructing to start moving image recording has been detected (Step S**28**).

Then, when judged that a user operation (REC button depression) for instructing to start moving image recording has been detected in the interval shooting mode (YES at Step S**28**), the CPU **21** judges whether recording related to interval shooting is being performed, or in other words, judges whether the timing of the detection of the user operation (REC button depression) for instructing to start moving image recording coincides with recording timing related to interval shooting (Step S**30**).

Then, when judged that the timing of the detection of the user operation (REC button depression) for instructing to start moving image recording coincides with recording timing related to interval shooting (YES at Step S**30**), the CPU **21** performs moving/still image auto-switch interval shooting (Step S**32**).

This moving/still image auto-switch interval shooting is processing where a still image or a moving image having a predetermined time length is selectively captured according to the occurrence conditions of motion blur and camera shake.

Then, the CPU **21** stores a captured still image or moving image in the folder for interval shooting in the external memory **18** (Step S**34**). In addition, the CPU **21** stores the recorded still image or moving image in the normal folder in the external memory **18** (Step S**36**).

That is, in the interval shooting mode, when it is judged that the timing of the detection of a user operation (REC button depression) for instructing to start moving image recording coincides with recording timing related to interval shooting, a recorded still image or moving image is stored in the folder for interval shooting in the external memory **18** as material for interval shooting, and also stored in the normal folder in the external memory **18** as in the case of a normal moving image.

At Step S**30**, when judged that the timing of the detection of the user operation (REC button depression) for instructing to start moving image recording does not coincide with recording timing related to interval shooting (NO at Step S**30**), the CPU **21** controls the imaging section **11** to perform moving image capturing under currently set imaging conditions (Step S**38**), and stores a captured moving image in the normal folder in the external memory **18** (Step S**40**).

That is, when a user operation (REC button depression) for instructing to start moving image recording is performed at timing other than recording timing related to interval shooting, a captured moving image is stored in the normal folder in the external memory **18** in a normal imaging manner.

After Steps S**36** and S**40**, the CPU **21** judges whether a user operation for ending the interval shooting has been performed (Step S**26** in FIG. **2**). Then, when judged that an operation for ending the interval shooting has not been performed (NO at Step S**26**), the CPU **21** returns to Step S**10**.

At Step S**28**, when judged that a user operation (REC button depression) for instructing to start moving image recording has not been detected in the interval shooting mode (NO at Step S**28**), the CPU **21** judges whether an interval trigger for automatic shooting has been detected (Step S**42**).

Then, when judged that an interval trigger for automatic shooting has been detected (YES at Step S**42**), the CPU **21** performs moving/still image auto-switch interval shooting (Step S**44**).

Next, the CPU **21** stores a captured still image or short movie in the folder for interval shooting in the external memory **18** (Step S**46**).

That is, in the interval shooting mode, when an interval trigger is detected, or in other words, when the timing of

interval shooting comes, a captured still image or short movie is stored in the folder for interval shooting in the external memory **18** as material for interval shooting.

Then, the CPU **21** judges whether a user operation for ending the interval shooting has been performed (Step S**26** in FIG. **2**).

When judged that an operation for ending the interval shooting has not been performed (NO at Step S**26**), the CPU **21** returns to Step S**10**.

FIG. **5** is a flowchart for describing operations in the moving/still image auto-switch interval shooting of the present embodiment.

First, the CPU **21** judges whether the imaging apparatus **1** has been fixed with a tripod or the like or been handheld by the user, or in other words, judges whether or not the imaging apparatus **1** has been fixed with a tripod or the like, based on information from the acceleration sensor **15** (Step S**50**).

When judged that the imaging apparatus **1** has been fixed with a tripod or the like (YES at Step S**50**), the CPU **21** judges whether a photographic subject (target to be imaged) is moving from images captured by the image sensor **13** or a detection result of the infrared sensor **16** (Step S**54**).

Specifically, when the value of the movement of the photographic subject is equal to or larger than a predetermined threshold value (second threshold value), the CPU **21** judges that the photographic subject is moving. Conversely, when the value of the movement of the photographic subject is less than the predetermined threshold value (second threshold value), the CPU **21** judges that the photographic subject is not moving, or in other words, standing still.

At Step S**54**, when judged that the photographic subject is moving (YES at Step S**54**), the CPU **21** controls the imaging section **11** to perform image capturing for five seconds, and stores image contents acquired by this five-second image capturing as a moving image (Step S**56**).

By image capturing and recording being performed in this way, a moving image corresponding to the movement of the photographic subject can be captured with less camera shake and recorded.

Then, the CPU **21** returns to the main routine.

At Step S**50** and Step S**54**, when judged that the imaging apparatus **1** has been fixed with a tripod or the like (YES at Step S**50**) and the photographic subject is not moving (NO at Step S**54**), the CPU **21** sets, as an imaging condition, a sensitivity higher than a normal sensitivity or a shutter speed faster than a normal shutter speed, and stores an image captured with this setting by the imaging section **11** as a still image (Step S**58**).

By image capturing and recording being performed in this way, an unblurred still image can be stored.

Then, the CPU **21** returns to the main routine.

At Step S**50**, when judged that the imaging apparatus **1** has been handheld by the user, or in other words, the imaging apparatus **1** has not been fixed with a tripod or the like (NO at Step S**50**), the CPU **21** judges whether the degree of camera shake being applied to the imaging apparatus **1** is less than a predetermined threshold value (first threshold value) from a detection result of the acceleration sensor **15** (Step S**52**).

Then, when judged that the degree of the camera shake being applied to the imaging apparatus **1** is less than the predetermined threshold value (first threshold value) (YES at Step S**52**), the CPU **21** judges whether the photographic subject is moving from images captured by the image sensor **13** or a detection result of the infrared sensor **16** (Step S**54**).

When judged that the photographic subject is moving (YES at Step S**54**), the CPU **21** controls the imaging section **11** to perform image capturing for five seconds, and stores image contents acquired by this five-second image capturing as a moving image (Step S**56**).

That is, a moving image corresponding to the movement of the photographic subject is captured with less camera shake and recorded. Then, the CPU **21** returns to the main routine.

At Step S**52** and Step S**54**, when judged that the degree of the camera shake being applied to the imaging apparatus **1** is less than the predetermined threshold value (first threshold value) (YES at Step S**52**) and the photographic subject is standing still (NO at Step S**54**), the CPU **21** sets, as an imaging condition, a sensitivity higher than a normal sensitivity or a shutter speed faster than a normal shutter speed, and stores an image captured with this setting by the imaging section **11** as a still image (Step S**18**).

That is, an unblurred still image is stored. Then, the CPU **21** returns to the main routine.

At Step S**50** and Step S**52**, when judged that the imaging apparatus **1** has been handheld by the user, or in other words, the imaging apparatus **1** has not been fixed with a tripod or the like (NO at Step S**50**) and the degree of the camera shake being applied to the imaging apparatus **1** is equal to or larger than the predetermined threshold value (first threshold value) (NO at Step S**52**), the CPU **21** sets, as an imaging condition, a sensitivity higher than a normal sensitivity or a shutter speed faster than a normal shutter speed, and stores an image captured with this setting by the imaging section **11** as a still image (Step S**58**).

That is, an unblurred still image is stored. Then, the CPU **21** returns to the main routine.

Note that, when the imaging apparatus **1** has been fixed with a tripod or the like, camera shake does not easily occur, and therefore either moving image capturing or still image photographing is performed based on the movement of the photographic subject.

Here, when the photographic subject is moving, since camera shake does not occur and a varied scene can be captured, moving image capturing is performed.

On the other hand, when the photographic subject is not moving, still image photographing is performed because an unvaried scene is captured even if moving image capturing is performed.

Also, when the imaging apparatus **1** has been handheld by the user, either moving image capturing or still image photographing is performed with reference to a predetermined acceptable range for the camera shake of the imaging apparatus **1**.

When the degree of the camera shake is out of the predetermined acceptable range, still image photographing is performed.

Here, high-speed shutter imaging is performed with a high sensitivity. That is, still image photographing that avoids image blurring as much as possible is performed.

By this operation, moving images that cause visually induced motion sickness due to substantial motion blur or panning of the imaging apparatus **1** can be avoided.

When the degree of the camera shake is within the predetermined acceptable range, since the degree of the camera shake of the imaging apparatus **1** is low, moving image capturing is performed.

FIG. **6** is a conceptual diagram showing an example of the folder structure of the external memory **18** for the imaging apparatus **1** of the present embodiment.

The external memory **18** is first formatted when it is used, and then a folder structure such as that shown in FIG. **6** is created.

That is, in the external memory **18**, a directory named "DCIM" is created as a root directory for storing photographed still images and captured moving images, and directories named "100NORMAL" and "102INTER" respectively are created as subdirectories.

In the example of the diagram, the directory "100NORMAL" is used as a normal directory, and the directory "102INTER" is used as a directory for interval shooting.

FIG. **7** is a flowchart for describing a playback operation by the imaging apparatus **1** of the present embodiment.

At the time of playback, the CPU **21** judges whether the user has performed an operation for creating a video by combining still images and moving images (Step S**60**).

Then, when judged that the user has performed an operation for creating a video by combining still images and moving images (YES at Step S**60**), the CPU **21** combines short moving images and still images in the folder for interval shooting in the external memory **18**, stores them as a moving image file (Step S**62**), and replays this moving image file (Step S**64**).

Conversely, when judged that the user has not performed an operation for creating a video by combining still images and moving images (NO at Step S**60**), the CPU **21** judges whether the user has performed an operation for performing slide show playback or frame-by-frame playback (Step S**66**).

When judged that the user has performed an operation for performing slide show playback or frame-by-frame playback (YES at Step S**66**), the CPU **21** judges whether this operation is an instruction to replay only images captured by the user (Step S**68**).

Then, when judged that this operation is an instruction to replay only images captured by the user (YES at Step S**68**), the CPU **21** replays moving images and still images in the normal folder in the external memory **18** in order (Step S**70**).

Conversely, when judged that this operation is not an instruction to replay only images captured by the user (NO at Step S**68**), the CPU **21** replays moving images and still images in the folder for interval shooting in the external memory **18** in order (Step S**72**).

Then, when any of the above-described Steps S**64**, S**70** or S**72** is completed, or when judged at Step S**66** that the user has not performed an operation for performing slide show playback or frame-by-frame playback, the CPU **21** judges whether the user has performed an operation for ending the playback (Step S**74**).

When judged that the user has not performed an operation for ending the playback (NO at Step S**74**), the CPU **21** returns to Step S**60**, and repeats the above-described processing. Conversely, when judged that the user has performed an operation for ending the playback (YES at Step S**74**), the CPU **21** ends the processing.

Note that, when being replayed, the moving images and still images are displayed on a display section (not shown) included in the imaging apparatus **1**, an external display section connected thereto by a cable or the like, or an external device having a display section (such as a dedicated display device, a smartphone, or a tablet terminal) wirelessly connected to the communication control section **10**.

In the present embodiment, still images and moving images recorded in the normal shooting mode and still images and moving images recorded in the interval shooting mode are stored and managed in different directories. However, the present invention is not limited thereto, and a configuration may be adopted in which identification information indicating the type of shooting mode used in imaging and recording is added to the header information of each recorded still image and moving image so that each image is associated with the shooting mode used to record it, and the still images and the moving images recorded in the respective shooting modes are stored in the same folder without being sorted into different folders.

By this configuration, an unnecessary increase of subfolders can be prevented.

In the above-described present embodiment, even if a user operation (shutter button depression) for instructing to start still image recording or a user operation (REC button depression) for instructing to start moving image recording is detected at recording timing in the interval shooting mode, a still image or a moving image based on the user's instruction operation is recorded by the imaging section **11** without the recording for the interval shooting being temporarily stopped. Then, the still image or the moving image recorded based on the user's instruction and a still image or a moving image recorded by the interval shooting are stored by being sorted into different folders, and managed. As a result of this configuration, a periodic imaging function can be continued without impairing user-friendliness.

Also, in the above-described present embodiment, even when recording timing related to interval shooting and the timing of a user operation for instructing to start recording do not coincide with each other, a still image or a moving image recorded by the interval shooting and a still image or a moving image recorded by the user's instruction operation are stored by being sorted into different folders, and managed. As a result of this configuration, a periodic imaging function can be continued without impairing user-friendliness.

Moreover, in the above-described present embodiment, when a user operation (shutter button depression) for instructing to start still image recording or a user operation (REC button depression) for instructing to start moving image recording is detected at recording timing in the interval shooting mode, a still image or a moving image captured by the user operation is stored and managed as a still image or a moving image acquired by interval shooting, so that they can be used as material for interval shooting.

Furthermore, in the above-described present embodiment, when a user operation (shutter button depression) for instructing to start still image recording or a user operation (REC button depression) for instructing to start moving image recording is detected at recording timing in the interval shooting mode, a still image or a moving image suitable for the interval shooting is generated from a still image or a moving image recorded by the user's instruction operation, which can be used as material for the interval shooting without a sense of incongruity.

Still further, in the above-described present embodiment, whether a still image or a moving image recorded by interval shooting and a still image or a moving image recorded by the user's instruction operation are separately outputted to be replayed or collectively outputted to be replayed can be selected. As a result of this configuration, when replaying images, the user can select whether to include manually captured images.

While the present invention has been described with reference to the preferred embodiments, it is intended that the invention be not limited by any of the details of the description therein but includes all the embodiments which fall within the scope of the appended claims.

What is claimed is:

1. An imaging apparatus comprising:

an imaging sensor;

a memory; and

a CPU which is operable to perform functions comprising:

a first imaging function comprising repeatedly acquiring an image by driving the imaging sensor at a preset timing,

a second imaging function comprising acquiring an image by driving the imaging sensor in response to receiving an instruction at arbitrary timing, while maintaining acquisition processing by the first imaging function,

storing, in the memory, the image acquired by the first imaging function and the image acquired by the second imaging function,

judging whether the arbitrary timing and the preset timing coincide with each other, and

when it is judged that the arbitrary timing and the preset timing coincide with each other, performing control to store, in the memory, the image acquired by one of the first imaging function and the second imaging function, as the image acquired by the other of the first imaging function and the second imaging function, or controlling the imaging sensor to cancel image acquisition by one of the first imaging function and the second imaging function.

2. The imaging apparatus according to claim 1, wherein, when it is judged that the arbitrary timing and the preset timing coincide with each other, the CPU performs control to manage the image acquired by the second imaging function at a coincided timing as the image acquired by the first imaging function.

3. The imaging apparatus according to claim 1, wherein, when it is judged that the arbitrary timing and the preset timing coincide with each other, the CPU performs control to produce an image corresponding to the image acquired by the second imaging function at a coincided timing, and manage the produced image as the image acquired by the first imaging function.

4. The imaging apparatus according to claim 3, wherein, when it is judged that the arbitrary timing and the preset timing coincide with each other, the CPU performs control to process the image acquired by the second imaging function at the coincided timing and manage the processed image as the image acquired by the first imaging function.

5. The imaging apparatus according to claim 4, wherein, when it is judged that the arbitrary timing and the preset timing coincide with each other, the CPU performs control to resize the image acquired by the second imaging function at the coincided timing and manage the resized image as the image acquired by the first imaging function.

6. The imaging apparatus according to claim 1, wherein the CPU controls the imaging sensor to acquire an image under a condition for acquisition at the preset timing, when an image is acquired by the first imaging function, and to acquire an image under a condition for acquisition at the arbitrary timing, when an image is acquired by the second imaging function.

7. The imaging apparatus according to claim 1, wherein the first imaging function acquires a still image or a moving image as the image at the preset timing.

8. The imaging apparatus according to claim 1, wherein the CPU stores, in the memory, acquired images in relation to information indicating whether the images have been acquired by the first imaging function or the second imaging function.

9. The imaging apparatus according to claim 1, wherein the CPU is operable to perform further operations comprising:

outputting and replaying images stored in the memory such that the image acquired by the first imaging function and the image acquired by the second imaging function are separately outputted and replayed.

10. The imaging apparatus according to claim 1, wherein the CPU is operable to perform further operations comprising:

outputting and replaying images stored in the memory such that the image acquired by the first imaging function and the image acquired by the second imaging function are collectively outputted and replayed.

11. An image controlling method for an imaging apparatus including a memory, the method comprising:

a first imaging process comprising repeatedly acquiring an image by driving an imaging sensor at a preset timing;

a second imaging process comprising acquiring an image by driving the imaging sensor in response to receiving an instruction at arbitrary timing, while maintaining acquisition processing by the first imaging process;

storing, in the memory, the image acquired by the first imaging process and the image acquired by the second imaging process;

judging whether the arbitrary timing and the preset timing coincide with each other; and

when it is judged that the arbitrary timing and the preset timing coincide with each other, performing control to store, in the memory, the image acquired by one of the first imaging process and the second imaging process, as the image acquired by the other of the first imaging process and the second imaging process, or controlling the imaging sensor to cancel image acquisition by one of the first imaging process and the second imaging process.

12. A non-transitory computer-readable storage medium having stored thereon a program that is executable by a computer in an imaging apparatus including a memory, the program being executable by the computer to perform functions comprising:

a first imaging function comprising repeatedly acquiring an image by driving an imaging sensor at a preset timing;

a second imaging function comprising acquiring an image by driving the imaging sensor in response to receiving an instruction at arbitrary timing, while maintaining acquisition processing by the first imaging function;

storing, in the memory, the image acquired by the first imaging function and the image acquired by the second imaging function;

judging whether the arbitrary timing and the preset timing coincide with each other; and

when it is judged that the arbitrary timing and the preset timing coincide with each other, performing control to store, in the memory, the image acquired by one of the first imaging function and the second imaging function, as the image acquired by the other of the first imaging function and the second imaging function, or controlling the imaging sensor to cancel image acquisition by one of the first imaging function and the second imaging function.

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